



EmulationEngine™
11a/b/g
User's Guide

v2.3

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Radio Frequency Interference Requirements

802.11a devices transmit in the 5 GHz band. 802.11b and 802.11g devices transmit in the 2.4 GHz band. FCC regulations require this product to be used indoors to reduce the potential for interference with (to or from) other devices that operate in the same frequency range.

FCC Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the radio /TV receiving antenna.
- Increase the separation between the equipment and the radio/TV receiver.
- Connect the equipment to an outlet that is on a different circuit from where the radio/TV receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Unless expressly approved by CMC, modifications to this product could void the user's authority to operate the equipment.

RF Exposure Requirements

To ensure compliance with FCC RF exposure requirements, the antenna used for this device must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or radio transmitter. Installers and end-users must follow the installation instructions provided in this guide.

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CHAPTER 1: Overview

The EmulationEngine is a test and measurement device that emulates up to 64 wireless stations in an IEEE 802.11 wireless LAN environment. The EmulationEngine operates in accordance with the IEEE 802.11a, 802.11b, and 802.11g specifications. The EmulationEngine is offered in three configurations:

- EmulationEngine 11a: Supports IEEE 802.11a only.
- EmulationEngine 11b: Supports IEEE 802.11b only.
- EmulationEngine 11a/b/g: Supports IEEE 802.11a, 802.11b, and 802.11g.

Each configuration is shipped with a unique feature key that is stored in the EmulationEngine's flash file system. The EmulationEngine software is locked to its specific hardware platform and feature set through the use of this feature key. Feature keys can be upgraded at any time to provide access to additional features.

The objective of the EmulationEngine is to reduce the number of PC and station NIC cards that are needed to test and stage 802.11 products and wireless LANs in terms of packet performance and number-of-stations capacity. In addition, it allows a user to fine-tune system parameters in order to maximize performance during testing. The primary difference between the EmulationEngine and other IP Load Generators is:

- IP-based Load Generators are per-station devices that do not reduce the number of PCs and station NIC cards. You can only configure an IP per station and then send traffic.
- The EmulationEngine allows all stations to be emulated on a single platform and radio chipset thus reducing the cost and complexity of multiple PCs.

CMC's EmulationEngine creates Virtual Stations (vSTAs) and generates or passes traffic that will load and stress test a Wireless LAN and 802.11 products in terms of:

- Frame performance
- Number-of-stations capacity
- Scalability
- WLAN optimization

Because a single physical 802.11a/b/g emulator emulates multiple STAs, it reduces the number of PC and station NIC cards that are needed to test and stage 802.11 products and wireless LANs.

Packaging Checklist

Your shipping container should include the following items:

- EmulationEngine
- Power Adapter
- Crossover cable
- Serial Cable
- Quick Start Guide
- Specifications

- Release Notes
- Warranty Card
- End User License Agreement
- Installation CD-ROM which includes this User's Guide, the EmulationEngine Test Setup & Configuration Guide, and the Perl SDK.

If any of these items are not included in your shipping container, contact CMC.

Feature List

- Supports IEEE 802.11a, 802.11b, and 802.11g
- Emulates up to 64 concurrent virtual stations (vSTAs)
- Interaction with virtual stations in real time
- Configuration and monitoring of virtual stations
- Internally inject load into a System Under Test (SUT)
- Externally forward load from third-party traffic generator into a System Under Test
- For external mode, frames can be captured based on the source 802.3 MAC address (Layer 2) or the source IP address (Layer 3).
- Log and performance statistics data
- vSTA support: 802.11 Authentication, Association, De-authentication, Disassociation
- ICMP Echo Request/Reply (Ping)
- WEP Encryption (Shared static key for authentication and data) per vSTA
- Persistent connection to the System Under Test
- DHCP Client: vSTAs can have IP addresses dynamically assigned from a DHCP server on the network rather than a fixed, configured IP address.
- Command Line Interface (CLI) and Web-Based User Interface.
- Telnet and Serial Port access to the CLI
- Automatically configure and run multiple virtual stations via the CLI
- The Web-Based User Interface supports:
 - ☑ Different types of graphs per time and virtual station
 - ☑ Export of event log and statistics data
 - ☑ Scenario scheduling to bring vSTAs online in a time appointed manner
 - ☑ User defined virtual station groups based on end-user requirements
 - ☑ Multiple types of reports
 - ☑ The ability to save test scenario files in order to repeat a test
 - ☑ Configuration and monitoring of virtual stations include: copy and paste, printing, and add and delete virtual stations
 - ☑ The ability to select a System Under Test
 - ☑ The ability to set up groups and select individual virtual stations to run through the 802.11 state machine

Files

The following files are maintained in the EmulationEngine's flash file system:

- 1) EmulationEngine Configuration (eecfg)
- 2) Scenario definitions
- 3) Logs
- 4) Statistics
- 5) EE22.SYS
- 6) keyfile

1) The EmulationEngine configuration file (eecfg) stores information settings that can be defined via the CLI or the web-based user interface. A backup version (.bak) of this file is also maintained in the unlikely event that the original might become corrupted. The EmulationEngine will load from this file at power-up/initialization time. It contains basic configuration information.

2) After the EmulationEngine is configured, you may create test scenarios that contain virtual station definitions that are organized into groups. This information is stored in scenario files. The scenario files are created and used by the web-based user interface. The CLI does not create or use scenario files.

3) Log files store records of all EmulationEngine activities with a time stamp indicating when the activity occurred. Logging to the CLI console, the web-based user interface, or a file can be enabled/disabled.

4) Statistics files contain statistics of a test (scenario) run. When a test is complete, a statistics file can be written in the flash file system for each virtual station involved in the test. The Reports section of the web-based user interface can be used to show the contents of these files.

5) The EE22.SYS file is the EmulationEngine software image file.

6) The keyfile is a reserved file that contains the EmulationEngine authorization code. It is a hidden file and will only be shown in the directory list in the CLI's administrative mode. Do not delete this file or attempt to access or modify it. It is required by the system.

System Requirements

- An A/C power outlet (100~240 V, 50~60 Hz) that will supply power to the EmulationEngine
- A PC with an available serial port or 10/100 Ethernet port that can be used to send commands to the EmulationEngine
- If the web-based user interface is used, the command PC must be equipped with the following:
 - ☑ Microsoft Windows 2000/XP
 - ☑ Microsoft Internet Explorer Version 6.0 or higher
 - ☑ Recommended Memory: 256 MB
 - ☑ Recommended Virtual Memory: 300 MB
 - ☑ Recommended Processor Speed: PIII 700 MHz.

Hardware Characteristics

Ethernet Compatibility: The EmulationEngine can attach directly to 10BASE-T/100BASE-TX (twisted-pair) Ethernet LAN Hubs, segments or a PC. All of these must conform to the IEEE 802.3 specification.

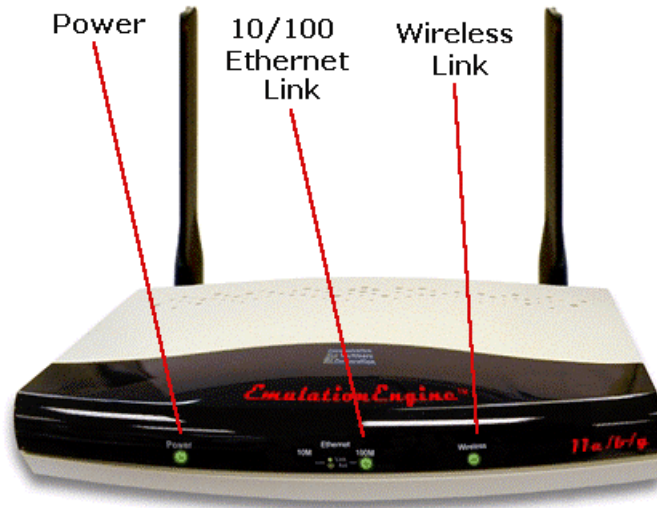
Radio Characteristics: The EmulationEngine conforms to the IEEE 802.11a, 802.11b, and 802.11g specifications. In 802.11a mode, it operates at the 5GHz Unlicensed National Information Infrastructure (UNII) band. Data is transmitted over a half-duplex radio channel operating at up to 54 Megabits per second (Mbps) using OFDM (Orthogonal Frequency Division Multiplexing). In 802.11b mode, the EmulationEngine operates in the 2.4 GHz band and sends data at up to 11 Mbps. In 802.11g mode, the EmulationEngine operates within the 2.4 GHz band using OFDM at rates up to 54 Mbps.

General Usage Notes

- 1) The EmulationEngine's default IP address is 192.168.0.50. In order to establish initial communications between the command PC and the EmulationEngine using an Ethernet connection, you must set your PC's IP address and network mask to match this default address (e.g., IP address: 192.168.0.2, Netmask: 255.255.255.0). After you establish communications using the default IP address, you can change the EmulationEngine's and your command PC's address to match the addressing scheme used in your network.
- 2) Depending on your feature key, the EmulationEngine can operate in 802.11a, 802.11b, or 802.11g wireless mode. The EmulationEngine's wireless mode affects the devices that you can select as a System Under Test. For example, an EmulationEngine that is operating in 802.11a wireless mode will not discover an 802.11b or 802.11g device. Make sure the wireless mode you select for the EmulationEngine is compatible with the device you wish to test. See EE->Configure EE in Chapter 5 and "set wirelessmode" in Chapter 6.
- 3) The EmulationEngine's Wireless LAN MAC address defaults to a specific address (typically in the 00:0b:cd:xx:xx:xx range). It is a globally unique MAC address that is programmed in to the EmulationEngine hardware. The WLAN base MAC address and mask (ff:ff:ff:ff:00:00) define the range of MAC addresses that can be assigned to virtual stations. When you specify a starting MAC address for virtual stations, make sure that address is within the range defined by the WLAN base MAC address and mask. See vSTA->New Emulation Group->vSTA and EE->Configure EE in Chapter 5 and "set eemac" and "set eemask" in Chapter 6.
- 4) The default WLAN base MAC address can be overridden to prevent conflict with other wireless devices. If you use multiple EmulationEngines at your facility, each should have a WLAN MAC whose prefix is unique. For example, on the first EmulationEngine, use WLAN MAC Address: 04:0d:e0:62:23:57 and on the second EmulationEngine, use WLAN MAC Address: 06:0f:14:62:32:a0.
- 5) The IP Mask of the EmulationEngine must match the IP subnet addressing scheme for internal mode testing (it is not used for external mode). For example, if the EmulationEngine's IP address is 10.1.40.18 and the System Under Test is 10.1.35.17, then the subnet mask must be 16 bits or 255.255.0.0 for an internal mode test.

CHAPTER 2: Connectors, LEDs & Antennas

Front Panel/LEDs



LED	Status	Description
Power	Off	Power is not supplied to the EmulationEngine
	On	Power is supplied to the EmulationEngine
	Flashing	Running a self test, loading software, or system errors
Ethernet Link 10/100 (See Note below)	10/100: Off	No Ethernet activity
	100: On Green	Indicates 100 Mbps Ethernet cable link
	10: On Green	Indicates 10 Mbps Ethernet cable link
	100: Flashing Green	The EmulationEngine is transmitting or receiving data on the 100 Mbps Ethernet LAN. Blink rate is proportional to network activity.
	10: Flashing Green	The EmulationEngine is transmitting or receiving data on the 10 Mbps Ethernet LAN. Blink rate is proportional to network activity.
Wireless Link	Off	Wireless link disabled
	On	Valid wireless link but the EmulationEngine is not joined with a System Under Test or the EmulationEngine has lost communication with a System Under Test and has not joined with any other System Under Test.
	Flashing	EmulationEngine has joined with a System Under Test.

NOTE: The Ethernet LED is normally ON while a link is detected. It turns OFF when a packet is received or transmitted. The OFF period is 50 milliseconds. If packets are being transmitted or received every 50 milliseconds or faster (e.g., 20 packets per seconds evenly spaced) for a sustained period, the LED will stay off. This is done by the hardware and the timing/proportionality is not adjustable.

Back Panel

Connectors

10/100 Ethernet Connector: This connector provides 10/100 Mbps connectivity to a wired Ethernet LAN. It is used to connect a command PC to the EmulationEngine.

Serial Port: This connector can also be used to connect a command PC to the EmulationEngine. The configuration of the serial port is: 9600 bps, 8 data bits, no parity, 1 stop bit, and no flow control

AC Power Connector: This connector is used to connect the EmulationEngine to the provided power supply.

Antennas

There are two antennas on the back of the device. The system chooses the best antenna for transmit and receive. The antennas can be swiveled 180 degrees and angled up or down to optimize signal gain.

Reset Button

A recessed reset button is located between the Ethernet Connector and Power Supply Connector on the back of the unit. It can be used to perform a hard reset of the EmulationEngine. To perform a hard reset, use a paper clip to press the reset button.

CHAPTER 3: Installation

Use the provided Power Adapter to supply power to the EmulationEngine.

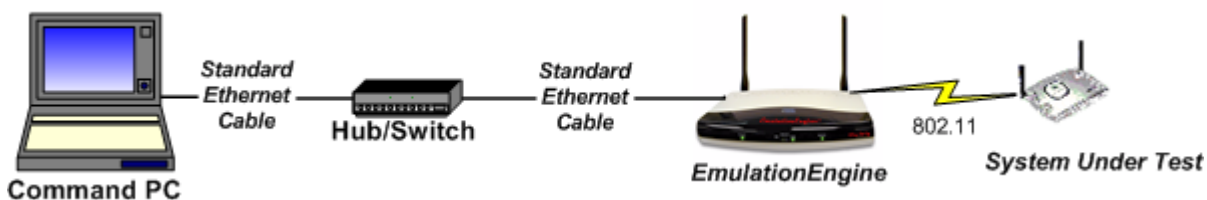
Connecting Directly to a Command PC

- Connect one end of the supplied Ethernet crossover cable to the Ethernet port on the command PC.
- Connect the other end of the crossover cable to the RJ-45 Ethernet Connector on the EmulationEngine.



Connecting Through an Ethernet Hub/Switch

- Connect one end of a standard Ethernet cable (not provided) to the Ethernet port on the command PC. Connect the other end of the cable to the Ethernet Connector on the Ethernet hub/switch.
- Connect one end of a standard Ethernet cable to a port on the hub/switch. Connect the other end of the cable to the Ethernet Connector on the EmulationEngine.



Connecting to the Serial Port (Optional)

- A standard straight serial cable is provided with the EmulationEngine.
- Connect the female connector end of the cable to a serial port on the command PC.
- Connect the male connector end of the cable to the serial port on the EmulationEngine.



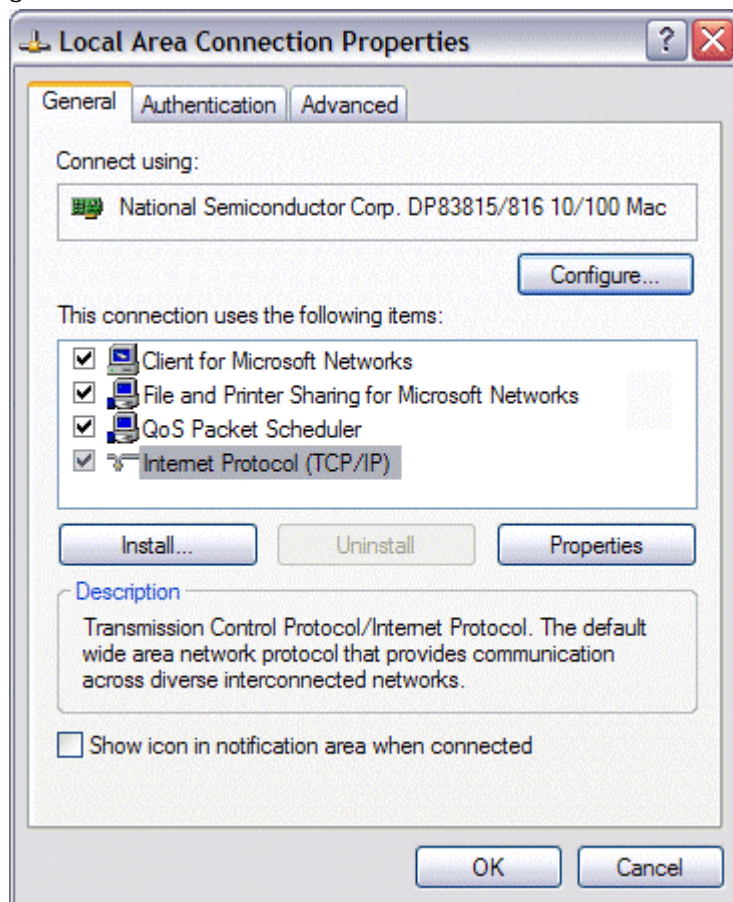


CHAPTER 4: Initial Setup

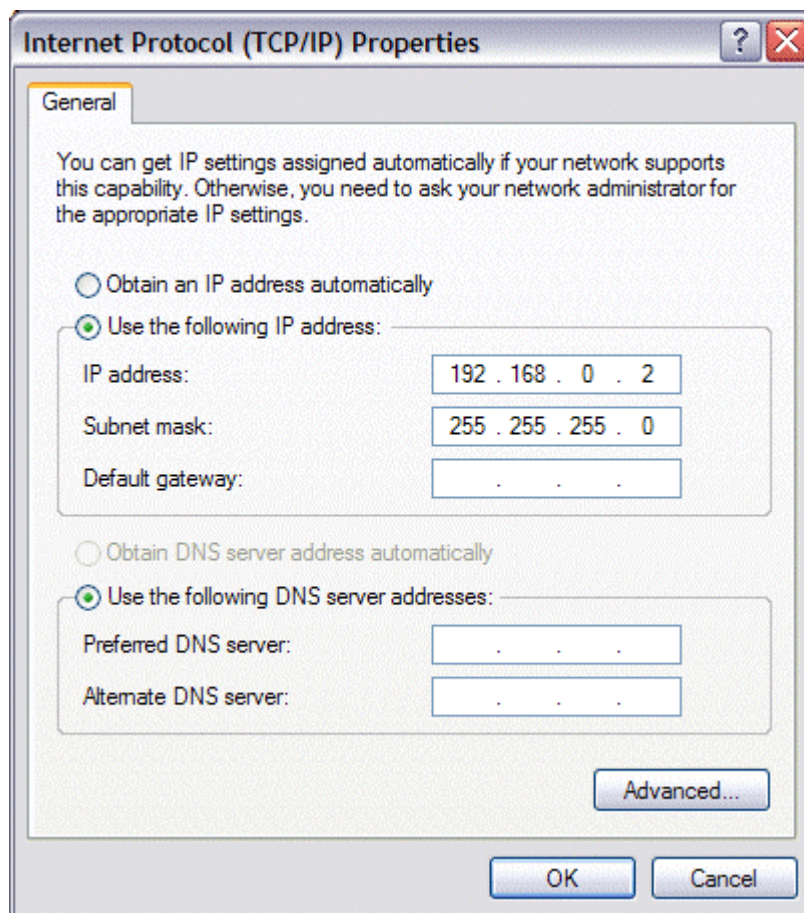
For an Ethernet Port Connection

If the Command PC is attached to the Ethernet Port on the EmulationEngine, complete the following steps to configure the Command PC and access the EmulationEngine web-based user interface or Command Line Interface (CLI):

- 1) Select **Control Panel** from the Start menu on the PC.
- 2) Double click on the **Network Connections** icon.
- 3) Right-click on the **Local Area Connection** icon for the Ethernet controller that is connected to the EmulationEngine. Select Properties from the right-click menu to display the Local Area Connection Properties dialog.



- 4) Select/highlight **Internet Protocol (TCP/IP)**.
- 5) Click the **Properties** button to display the Internet Protocol (TCP/IP) Properties dialog.



6) Select the "Use the following IP address" radio button and enter the IP address for the Ethernet connection. Use an IP Address that resides on the same IP subnet as the EmulationEngine. For example, use 192.168.0.2 if you are using the EmulationEngine's default IP address 192.168.0.50.

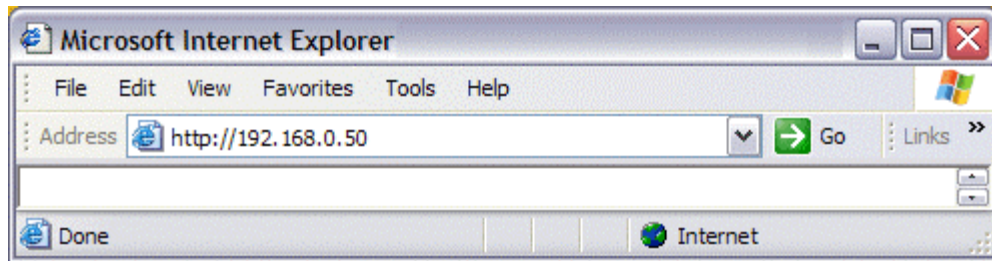
7) Click "OK" to close the Internet Protocol (TCP/IP) Properties dialog.

8) Click the Close button in the Local Area Connection Properties dialog.

You can access the EmulationEngine using one of the following methods.

Web-Based User Interface: You can use a PC with Microsoft Windows 2000/XP and Internet Explorer (Version 6.0 or higher) to access the web-based user interface.

- Launch Internet Explorer on the command PC.
- Select Internet Options from the Tools menu. Select the Settings button and make sure the "Every Visit to Page" radio button is selected in the Settings dialog. This step is only required the first time you use the web-based user interface.
- For initial setup, use the EmulationEngine's default IP address 192.168.0.50. Example:



Command Line Interface (CLI): You can use a PC that is connected via Telnet to access the CLI. For initial setup, use the EmulationEngine's default IP address 192.168.0.50 to establish a Telnet connection.

Example:

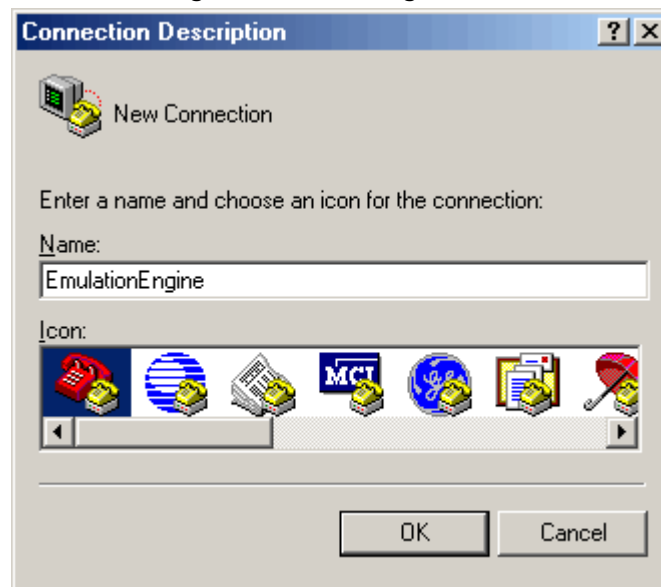
```
telnet 192.168.0.50
```

See Chapter 5 for information about using the web-based user interface.
See Chapter 6 for information about using the CLI.

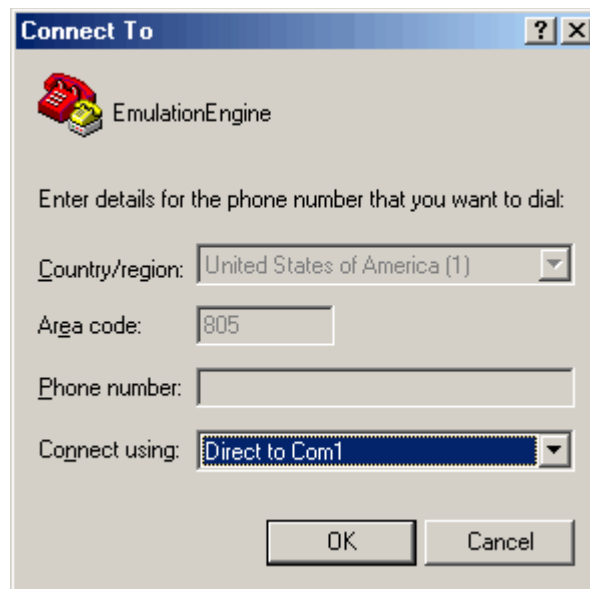
For a Serial Port Connection

If the command PC is connected to the EmulationEngine via the serial port, the web-based user interface is not available. Use the following procedure to configure the Command PC and access the EmulationEngine Command Line Interface (CLI):

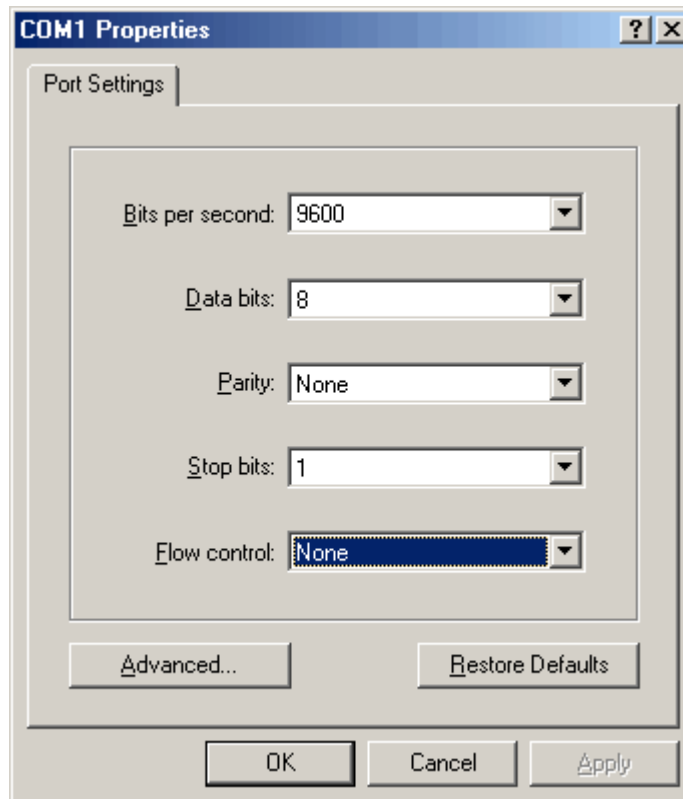
- 1) At the Command PC, launch a terminal-emulation program such as HyperTerminal.
- 2) In the Connection Description dialog, enter a name for the connection in the Name field (e.g., EmulationEngine).



- 3) Choose an icon for the connection and click OK to display the Connect To dialog:



- 4) Select the COM port that is connected to the EmulationEngine from the "Connect using" list box. Click OK to display the COM properties dialog:



- 5) Set the COM port settings as shown in this dialog: Bits per second: 9600, Data bits: 8, Parity: None, Stop bits: 1, Flow control: None.
- 6) Click OK to close the COM properties dialog.

The POST (Power On Self-Test) appears on the HyperTerminal screen a few seconds after the EmulationEngine is connected to the power source.

POST...

Memory test : passed
Ethernet MAC register test : passed

```
Ethernet PHY register test      : passed
Ethernet interrupt test         : passed
P1

Atheros AP 8245 Reference Design version 2.3.0.70
0
auto-booting...

Attaching to TFFS... done.
Loading /fl/ee22.sys...1028084
Starting at 0x480000...

Reading Configuration File "/fl/eecfg".
Configuration file checksum: 19eb7 is good
Please check the ethernet cable!
Attaching interface lo0...done

Starting WLAN ...
Starting quick passive scan ...

Passive scanning 5 GHz 54Mbps (802.11a) channels for 7
seconds...

CMC EmulationEngine Ready

EE login:
```

When the EE login prompt is displayed, use the information in Chapter 6 to log in and access the EmulationEngine CLI.



CHAPTER 5: The Web-Based User Interface

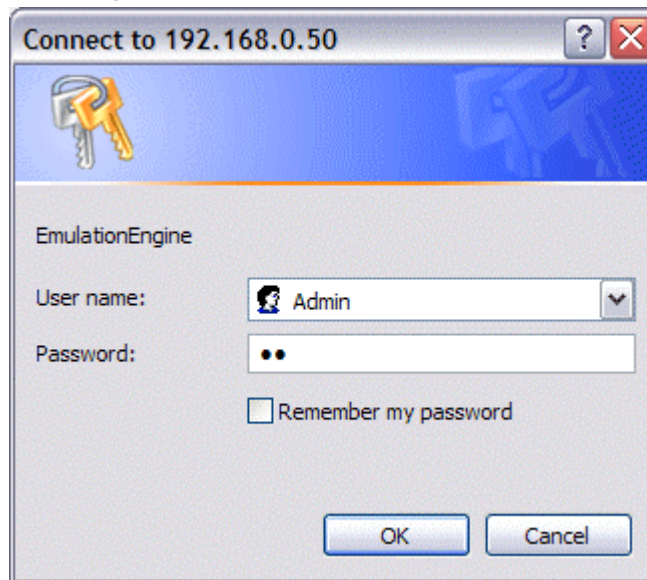
System Requirements

The command PC must be equipped with:

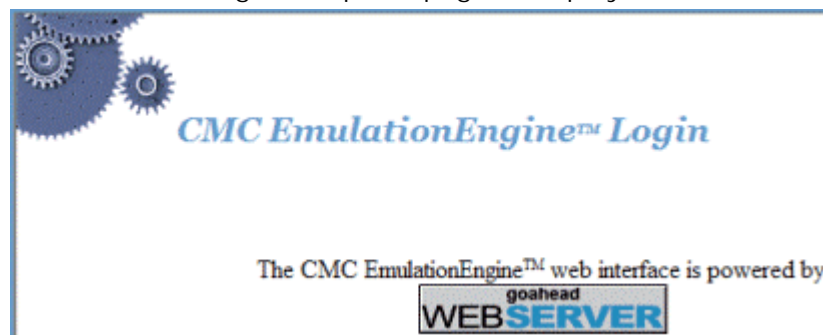
- Microsoft Windows 2000/XP
- Microsoft Internet Explorer Version 6.0 or higher
- Recommended Memory: 256 MB
- Recommended Virtual Memory: 300 MB
- Recommended Processor Speed: PIII 700 MHz

Start-Up/Login

- Launch Internet Explorer.
- Enter the IP address of the EmulationEngine in the URL address field of the browser (e.g., <http://192.168.0.50>).

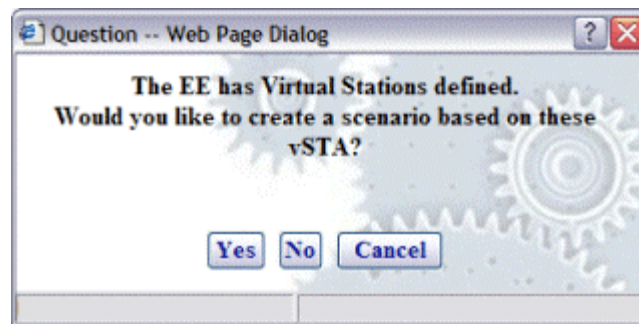


Enter your user name and password and select "OK" to access the EmulationEngine web server. The default user name is "Admin". The default password is "EE". The user name and password are case sensitive. After successful log in, a splash page is displayed for a few seconds:



Choosing a Scenario/Test

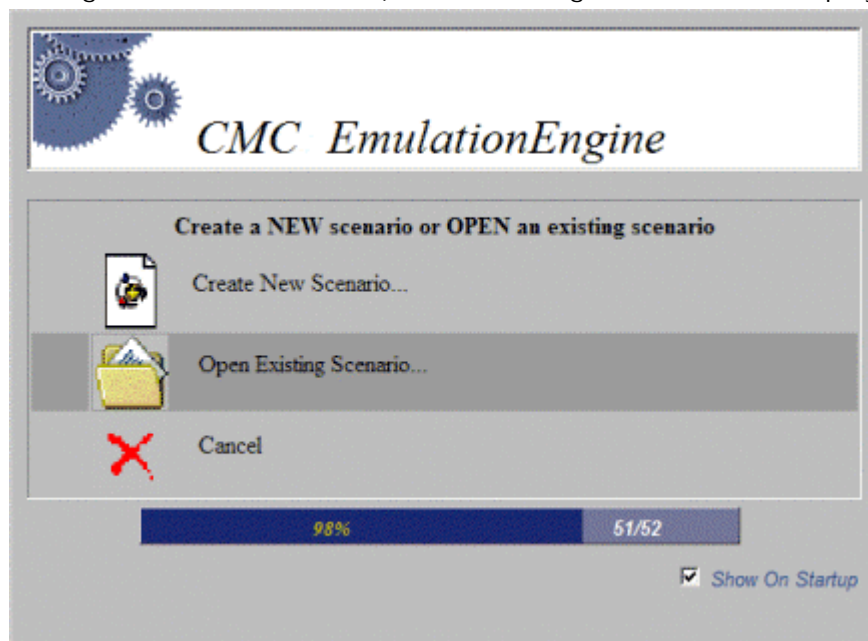
If the EmulationEngine already contains virtual station definitions, the following dialog will be displayed:



- Select "Yes" to build a scenario in the user interface that is based on the virtual stations that are already defined in the EmulationEngine.
- Select "No" to delete the virtual station definitions in the EmulationEngine and create a new empty scenario.
- Select "Cancel" to retain the virtual stations in the EmulationEngine but do not create a new empty scenario. When the main page is displayed, you can display the Scenario Summary Report, Group Summary Report, and Event Log for these existing virtual stations.

Following a Yes, No, or Cancel selection, the web-based user interface main page is displayed.

If there are no virtual station definition in the EmulationEngine and the welcome screen has not been disabled in the UI Configuration dialog (see Configuration->Preferences), the following screen will be displayed:

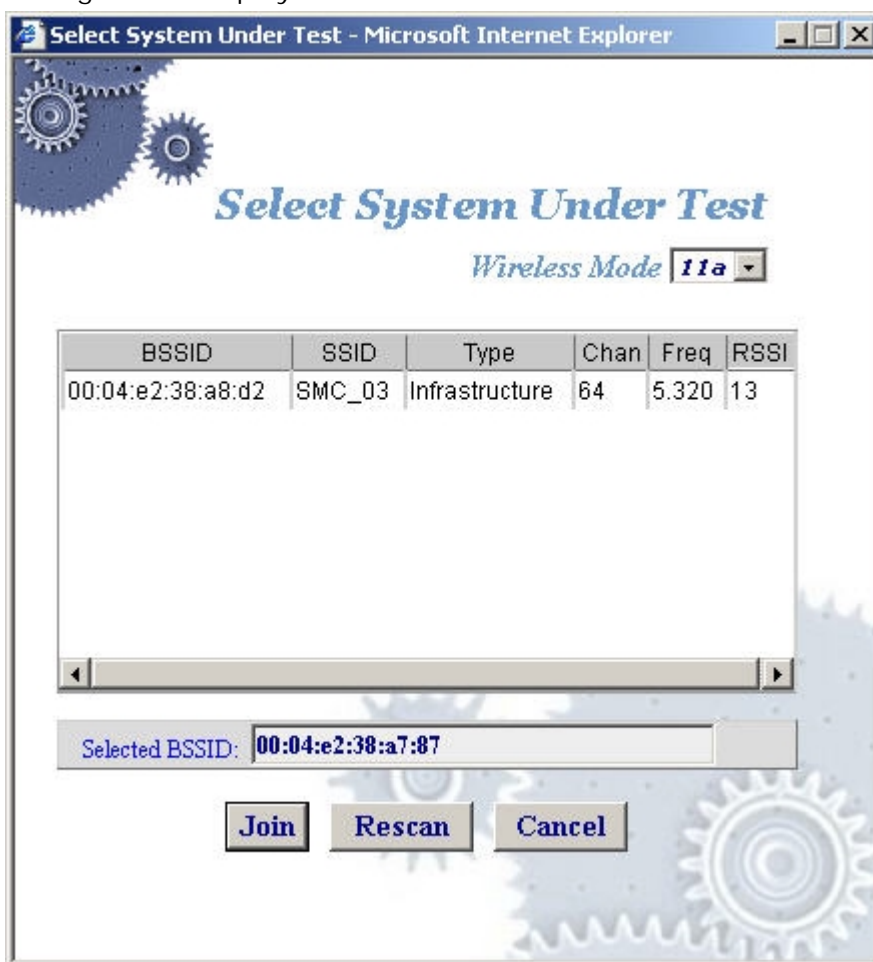


- Select "Create New Scenario" to select a System Under Test. When you create a new scenario, the user interface provides a list of active Basic Service Set IDs (BSSIDs) that have been detected.
- Select "Open Existing Scenario" to choose from a list of scenario files that have already been created. When you open an existing scenario, the EmulationEngine information is already stored with the scenario file.
- Select "Cancel" to exit this dialog. You can create a new scenario or open an existing scenario in the main page.

- Uncheck the "Show On Startup" checkbox if you do not want to show this screen each time you access the EmulationEngine web server. You can restore this screen on start-up in the UI Configuration dialog (See Configuration->Preferences).

Create New Scenario

If you selected "Create New Scenario" in the welcome screen and have not previously joined with a System Under Test, the Select System Under Test dialog will be displayed:



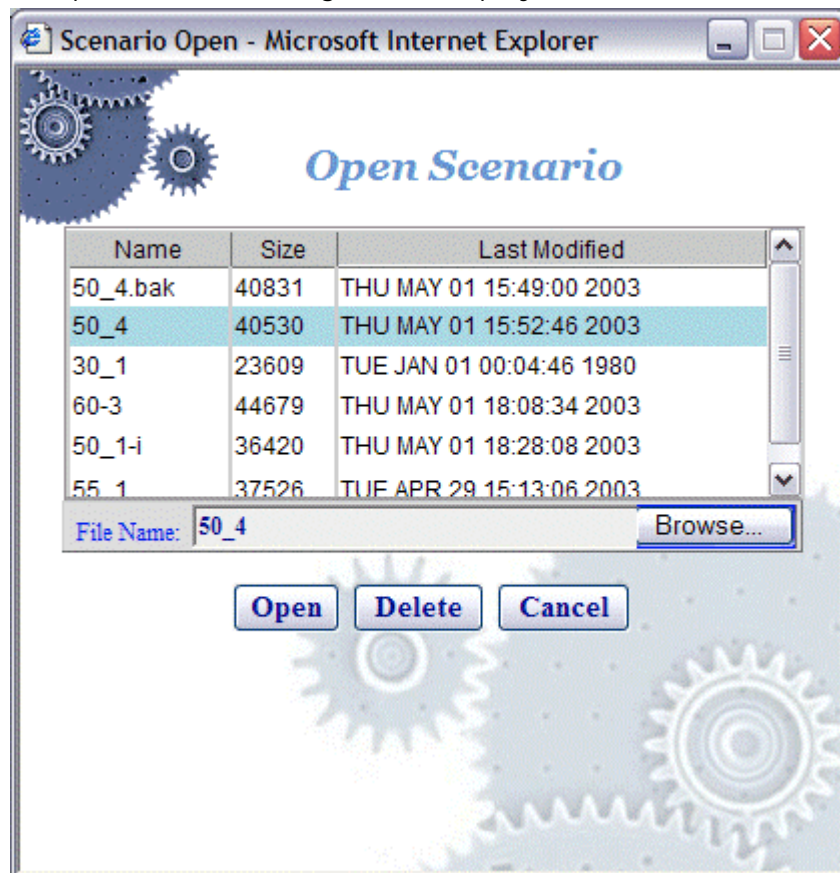
Wireless Mode: This field shows the EmulationEngine's current wireless mode (11a, 11b, or 11g). You can select a different wireless mode from the list box. The web-based user interface will issue a command to the EmulationEngine to change its wireless mode and scan for compatible systems. The results of the new scan will be reflected in the BSSIDs in the list box.

Select a BSSID in the list box. The selected BSSID will be shown in the "Selected BSSID" text box.

- Select "Join" to join with the selected target system.
- Select "Rescan" to update the list of BSSIDs. This selection will cause the EmulationEngine to scan for Basic Service Set IDs.
- Select "Cancel" to close this dialog without selecting a target system. You can select a target system and create or open an existing scenario in the main page.

Open Existing Scenario

If you selected "Open Existing Scenario" in the welcome screen and have not joined with a target system, the Select System Under Test dialog is displayed as described above. After you have joined with a target system, the Open Scenario dialog will be displayed:

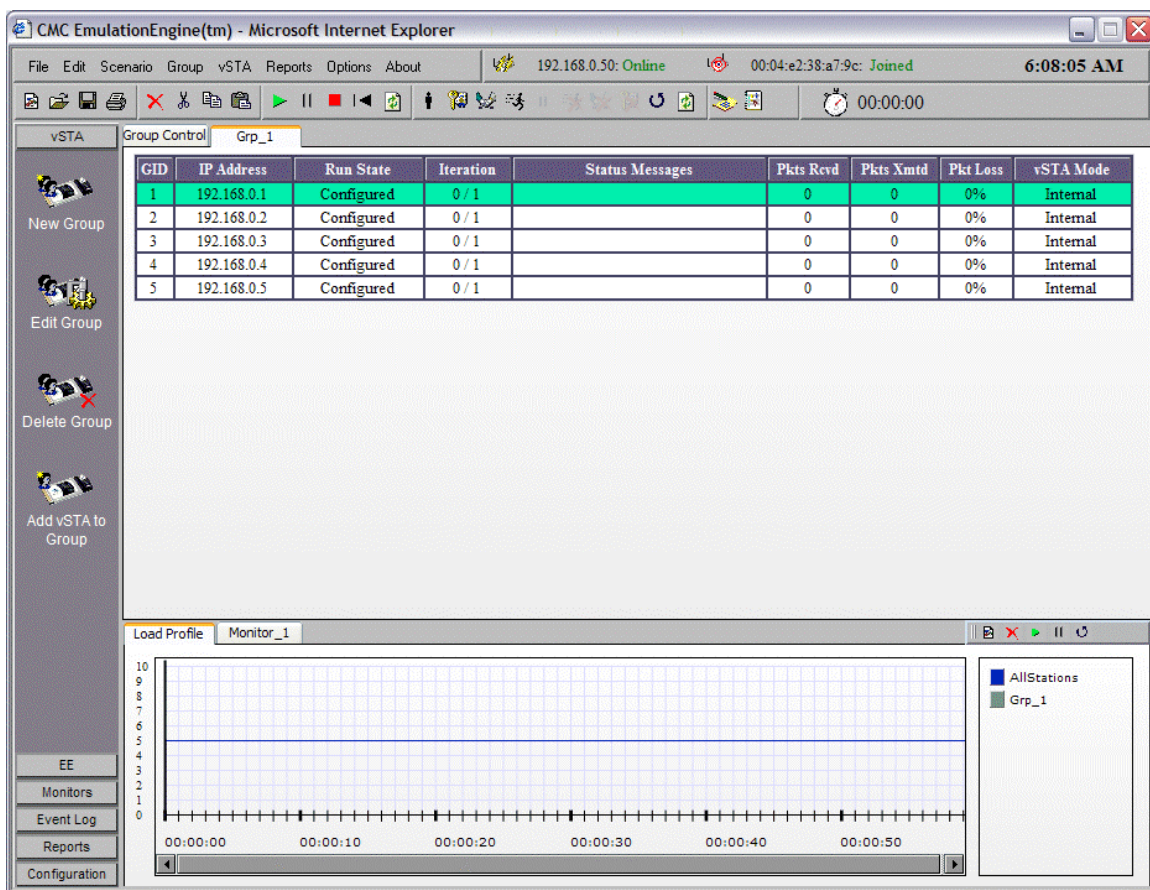


The list box shows a list of scenario files on the EmulationEngine. Select "Browse" to select from scenario files stored on the command PC. Click on a file name in the list of scenario files.

- Select "Open" to open the selected scenario file and continue.
- Select "Delete" to delete the selected file.
- Select "Cancel" to close this dialog without opening a scenario file. You can create a new scenario or open an existing scenario in the main page.

The Main Page

The following illustration shows the format of the main page that is displayed after you select any of the options in start-up dialogs:



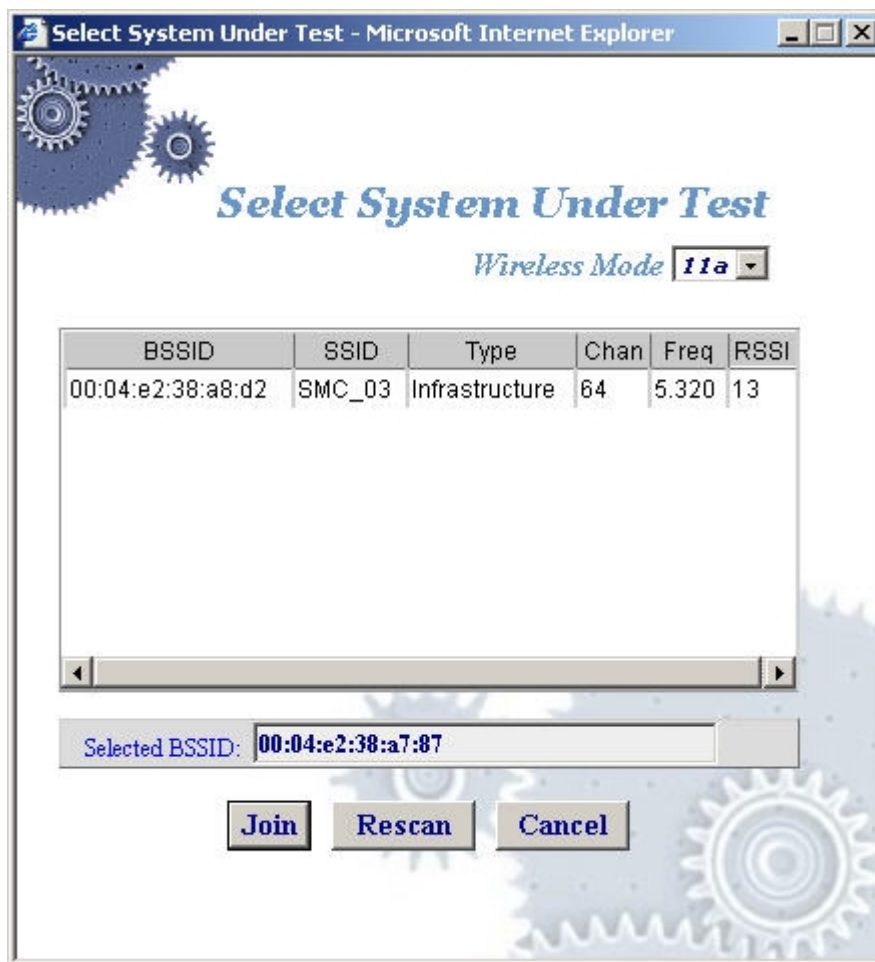
The content of this page will be different depending on whether you created a new scenario, opened an existing scenario, or cancelled/closed any of the start-up dialogs. This example page shows an existing scenario where one group is defined. This section of the page will be blank (No Scenario Defined) if a scenario has not been created.

If you successfully opened a scenario file or chose to use one that is already defined in the EmulationEngine, you can continue with the testing functions that are available in the menus and toolbar. See "Running a Test". If you selected "Create New Scenario", you must create a group of virtual stations. If you selected "Cancel", you must select and join with a target system and create a new scenario that contains one or more group(s) of one or more virtual station(s).

Creating an Internal Mode/Ping Test

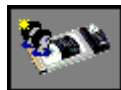
For a simple internal mode/ping test, complete the following steps.

Step 1) If you have already opened or created a scenario, skip to step 2. Otherwise, select "New Scenario" from the File menu to show the Select System Under Test dialog.



Wireless Mode: This field shows the EmulationEngine's current wireless mode (11a, 11b, or 11g). You can select a different wireless mode from the list box. The web-based user interface will issue a command to the EmulationEngine to change its wireless mode and scan for compatible systems. The results of the new scan will be reflected in the BSSIDs in the list box.

Click on a BSSID in the list box and click "Join" to continue.



Step 2) Select New Group from the vSTA side bar to show the New Emulation Group dialog.

New Emulation Group

Group Name

EE Address

Number of Virtual Stations

vSTA Traffic Runtime On Error Encryption

Starting IP Address

Netmask

Ending IP Address

Address Generation

Starting MAC Address

WLAN MAC Mask

Ending MAC Address

Address Generation

Create Cancel

Step 3) If you want the EmulationEngine to dynamically assign IP addresses, select DHCP from the Address Generation drop-down list box. Otherwise, enter an IP address in the Starting IP Address field to define the starting IP address to be used by virtual stations that are created in this scenario. Virtual stations will be created with unique IP addresses, sequentially or randomly, based on this starting IP address.

Step 4) Select the Traffic tab.

New Emulation Group

Group Name:

EE Address:

Number of Virtual Stations:

Tabs: vSTA | **Traffic** | Runtime | On Error | Encryption

Traffic Source: ☐ Layer 2 ☒ Layer 3

Ping

Target IP Address:

Packet Length: bytes

Count: pings/iteration

Step 5) Make sure the Target IP Address field is set to the address of a target server to be pinged. The default IP address (0.0.0.0) shown in this example screen must be replaced by a valid IP address (e.g., 10.10.10.19). Click "Create" to create a group with five virtual stations. See "vSTA->New Group" for more information about defining and editing groups and virtual stations in a scenario.

Creating an External Mode Test

For an external mode test, a third-party load generator outside the EmulationEngine must be set up to provide the traffic to be forwarded to the System Under Test.

- Use the documentation provided by the manufacturer to set up the load generator.
- See the EmulationEngine Test Set-Up & Configuration Guide for more information about setting up an external mode test.

- Complete steps 1) through 4) as described above for "Creating an Internal Mode Test".
- In Step 5), select "External" in the "Traffic Source" field and select the Layer 2 radio button to capture frames based on 802.3 MAC source address or the Layer 3 radio button to capture frames based on IP source address.
- Click the Create button to create the scenario for an external mode test.

Running a Test

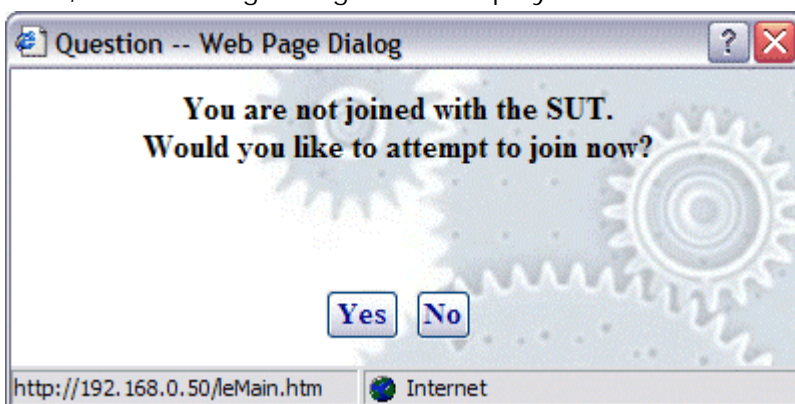


Click this button in the toolbar to run the scenario/test for all groups and all virtual stations in a scenario.



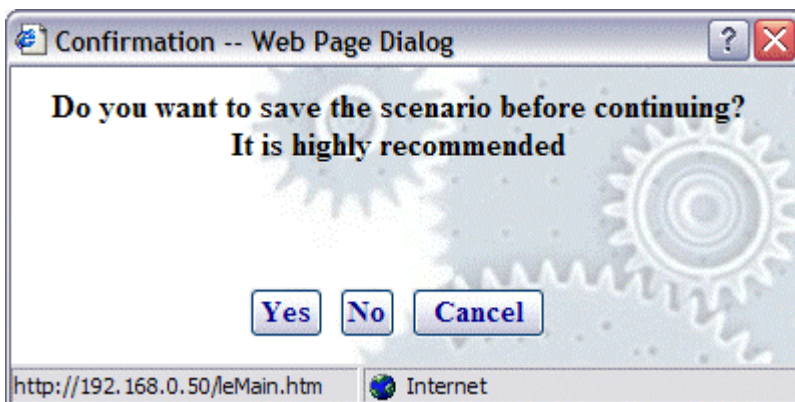
Click this button in the toolbar to run a test for selected virtual stations or groups.

If you created a new scenario and have not yet joined with a target system, the following dialog will be displayed:

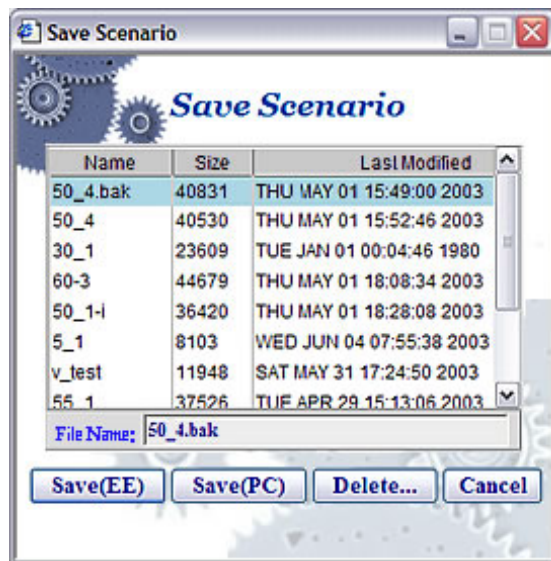


Click "Yes" to show the Select System Under Test dialog and join with the System Under Test.

If you created a new scenario and have not saved it using the Save Scenario option in the File menu, a dialog will prompt you to save the scenario.

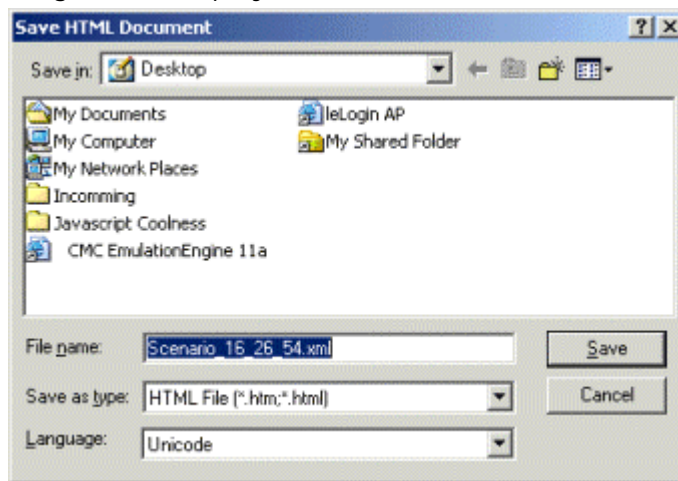


Select "Yes" to save the scenario file. The Save Scenario dialog is displayed:



Type a name in the File Name field. Do not use colon (:), asterisk (*), question mark (?), quotes ("), less-than/greater than signs (< >), vertical bar (|), or spaces in a file name.

- Select "Save(E)" to save the scenario in the EmulationEngine's flash file system.
- Select "Save(PC)" to save the scenario on the command PC. A standard save dialog will be displayed.



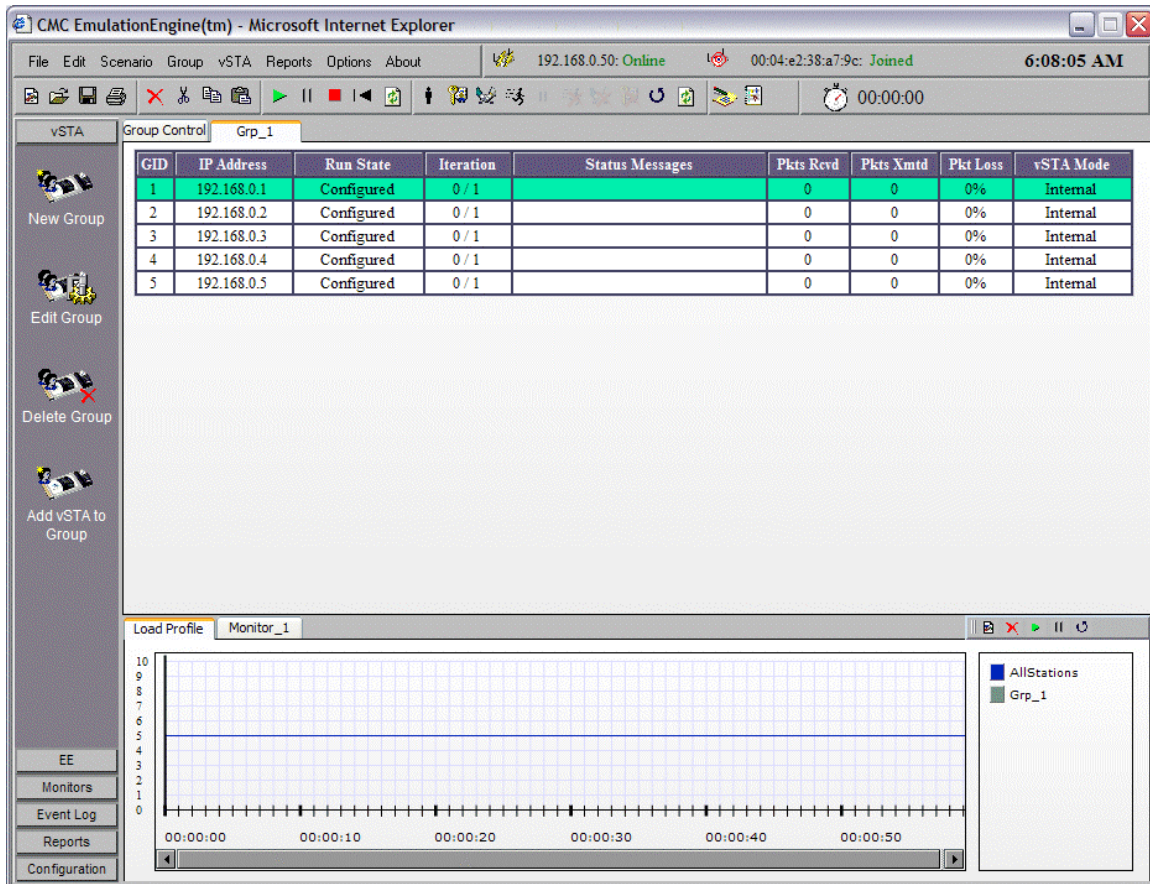
Type a name in the File Name field. Do not use colon (:), asterisk (*), question mark (?), quotes ("), less-than/greater than signs (< >), vertical bar (|), or spaces in a file name. A disk drive specification (e.g., C:/, D:/) is optional. Select "Save" to save the scenario at the designated location on the command PC.

The virtual stations will start running a few seconds after the scenario has been saved. As the test runs, you will see the "Run State" in the group grid go through the 802.11 states: configure, initialize, authenticate, associate, and run. When an internal mode/ping test is complete, the "Run State" will display "Done".

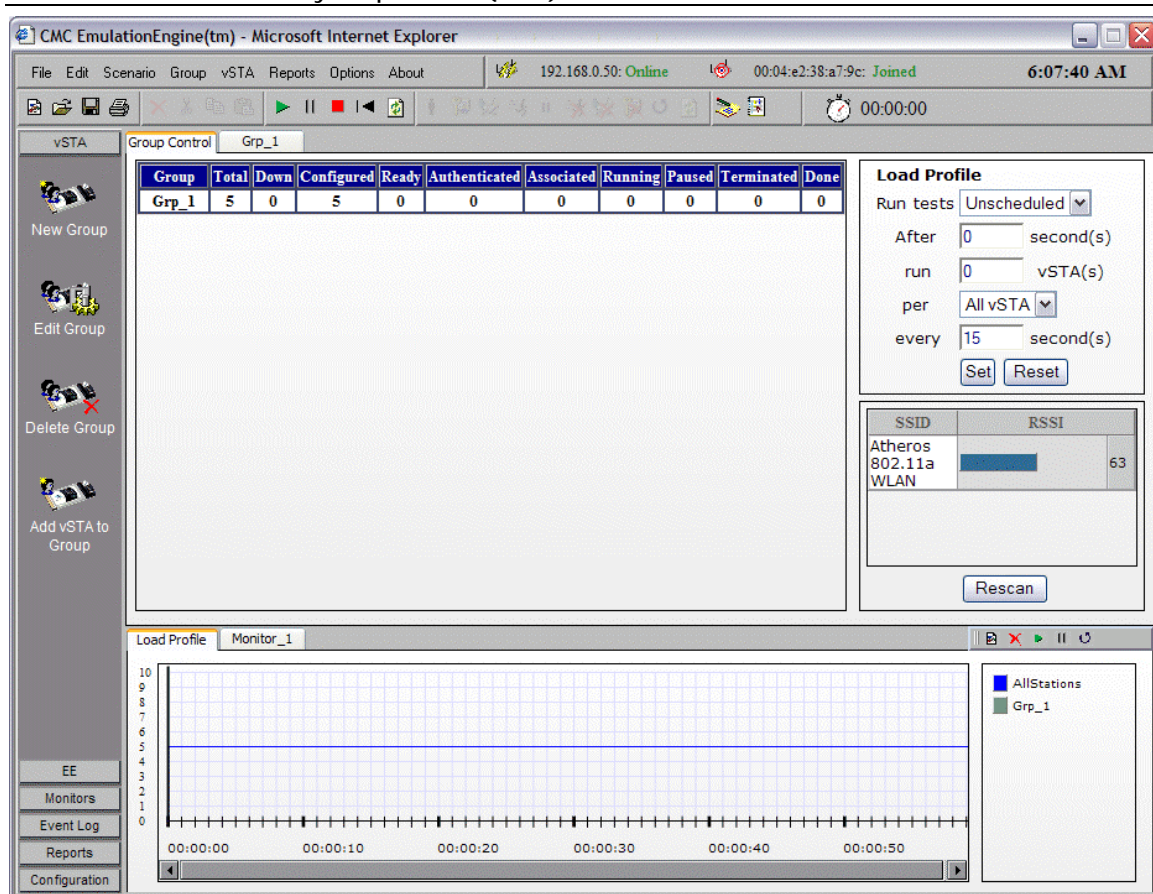
NOTE: Any interaction with a running test can affect the operation of the test which may result in skewed statistics.

About/Using the Main Page

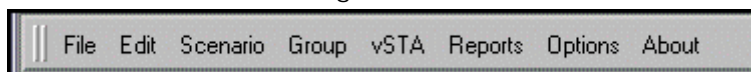
The following illustration shows the general format of the main page where a scenario with one group of virtual stations has been defined and the group tab (Grp_1) is selected:



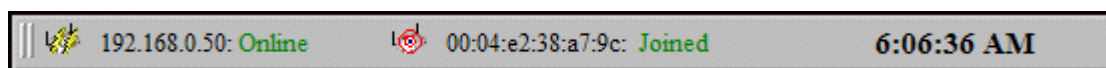
When the "Group Control" tab is selected, the main page will show the Load Profile and a list of devices that have been discovered (if any) in a scan:



- **Menu Toolbar:** The top-left toolbar at the top of the page is a drop-down menu bar of all EmulationEngine functions.



- **Status Toolbar:** The top-right toolbar shows the status of the EmulationEngine, the System Under Test and the current time on the command PC.



The status (e.g., Online) next to the EmulationEngine IP Address Address indicates the current status of the EmulationEngine with the web-based user interface. This status may intermittently display "Busy" or "Offline". If the Busy or Offline status displays frequently or for extended periods of time, check the Polling Interval and Polling Timeout values in the Configure EmulationEngine dialog (see EE->Configure EE). Also see Chapter 9, Troubleshooting/EmulationEngine Busy or Not Responding. The status (e.g., Joined) next to the BSSID/MAC address indicates the current status of the EmulationEngine with a System Under Test.

- **File Toolbar:** This toolbar is used to create, open, save and print scenarios.



- **Edit Toolbar:** This toolbar is used to delete, cut, copy, and paste virtual stations within and between groups. It can also be used to delete groups when a group is selected in the group control tab/table.



- **Scenario Toolbar:** The buttons in this section of the toolbar can be used to run, pause, stop, restart, or refresh the entire scenario of all virtual stations.



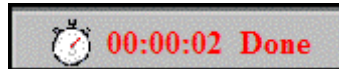
- **vSTA Toolbar:** The buttons in this toolbar are used to initialize, authenticate, associate, run, pause, stop, disassociate, de-authenticate, restart, or refresh selected virtual stations or groups of virtual stations.



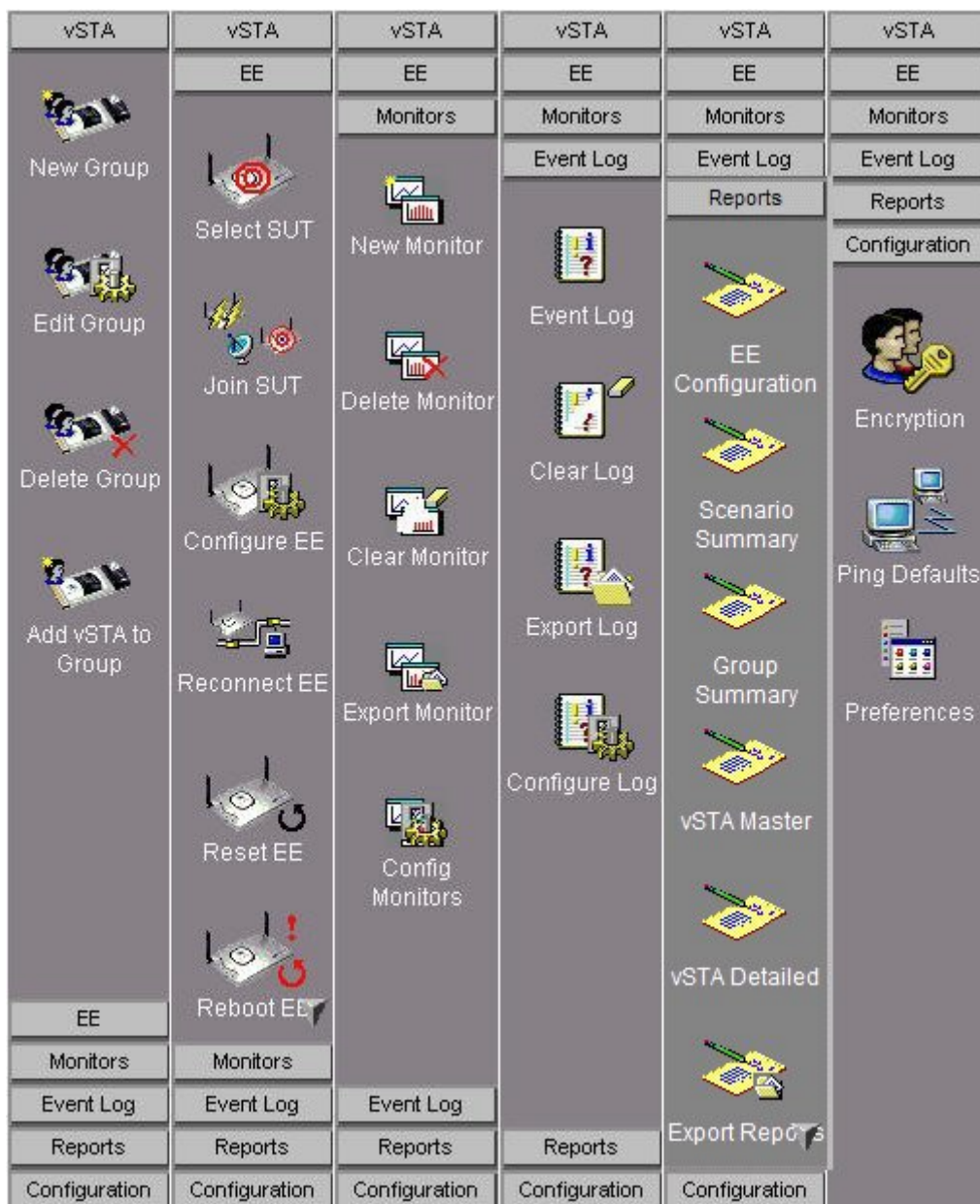
- **Reports Toolbar:** The buttons in this toolbar are used to view reports and the event log:



- **Test Clock:** The clock icon and time (hh:mm:ss) immediately adjacent to the Reports Toolbar, shows the elapsed duration of a test that is in progress or the most recent test that completed:



- **Side Bar Buttons:** The buttons in the side bar provide access to most virtual station, EmulationEngine, monitoring, logging and report functions as well as user interface and encryption configuration.



Group Control Grid

When the Group Control tab is selected, the table shows the status of each group and its associated virtual stations:

Group Control										
Group	Total	Down	Configured	Ready	Authenticated	Associated	Running	Paused	Terminated	Done
Grp_1	8	0	8	0	0	0	0	0	0	0
Grp_2	8	0	8	0	0	0	0	0	0	0
Grp_3	8	0	8	0	0	0	0	0	0	0
Grp_4	8	0	8	0	0	0	0	0	0	0

Group: This field displays the name of each group. The name is assigned in the New Emulation Group dialog (See vSTA->New Group).

The remaining fields in the group line are counters that show the state of each group's virtual stations during a test.

Total: This field shows the total number of virtual stations in each group.

Down: This field shows the total number of virtual stations in a group that have not been configured in the EmulationEngine and are in a “down” state.

Configured: This field shows the total number of virtual stations in each group that have been configured in the EmulationEngine.

Ready: This field shows the total number of virtual stations in each group that are ready (in the initialized state) to begin testing. These virtual stations have been initialized in the EmulationEngine.

Authenticated: This field shows the total number of virtual stations in each group that have authenticated with the System Under Test.

Associated: This field shows the total number of virtual stations in each group that have associated with the System Under Test.

Running: This field shows the total number of virtual stations in each group that are currently performing an operation defined by the scenario. The operation that is being performed depends on whether the virtual stations are configured for internal or external traffic generation.

Paused: This field shows the total number of virtual stations in each group that have paused in their execution.

Terminated: This field shows the total number of virtual stations in each group that have been terminated. These virtual stations must be reset before they can be used again.

Done: This field shows the total number of virtual stations in each group that have completed their run of an internal mode/ping test. This field will not be incremented for virtual stations that are running an external mode test or an internal mode test with infinite iterations.

Group Tabs: Each group defined in the scenario has its own tab. When an individual group tab is selected, the table shows details of each virtual station in the group.

Group Control Grp_1								
GID	IP Address	Run State	Iteration	Status Messages	Pkts Rcvd	Pkts Xmitd	Pkt Loss	vSTA Mode
1	10.1.35.101	Configured	0 / 1		0	0	0%	Internal
2	10.1.35.102	Configured	0 / 1		0	0	0%	Internal
3	10.1.35.103	Configured	0 / 1		0	0	0%	Internal
4	10.1.35.104	Configured	0 / 1		0	0	0%	Internal
5	10.1.35.105	Configured	0 / 1		0	0	0%	Internal

GID: The global ID is a unique ID that is assigned by the EmulationEngine to each virtual station in a scenario group. It is a unique ID across all groups in the EmulationEngine.

IP Address: This field shows each virtual station's IP Address.

Run State: This column shows the current state of each virtual station in the scenario group (i.e., Initializing, Authenticating, Authenticated, Associating, etc.).

Iteration: The two numbers in this column show the current iteration of the test that a virtual station is running or has completed and the number of iterations that are configured for the virtual station (e.g., 5/10 = 5 iterations have been completed/10 iterations are to be run). These numbers can be a value in the range zero (0) to 9999 or Infinite.

Status Messages: This column shows status and/or error messages returned by the EmulationEngine for each virtual station in the scenario group. See Appendix D for a list of messages that may be displayed in this column.

Pkts Rcvd: This column shows the total number of packets received by each virtual station in this group.

Pkts Xmtd: This column shows the total number of packets transmitted by each virtual station in this group.

Pkt Loss: This column shows the percentage of packet loss for each virtual station in this group.

vSTA Mode: This column shows the traffic generation mode (Internal or External) of each virtual station in the scenario group.

You can select one or more line items/virtual stations in the table and choose a menu item or toolbar button to execute a command for an individual or multiple virtual stations.

You can double click on a virtual station line item in the table to display the Edit Virtual Station dialog:

Edit vSTA

Group Name

EE Address

vSTA ID

vSTA
 Traffic
 Runtime
 On Error
 Encryption

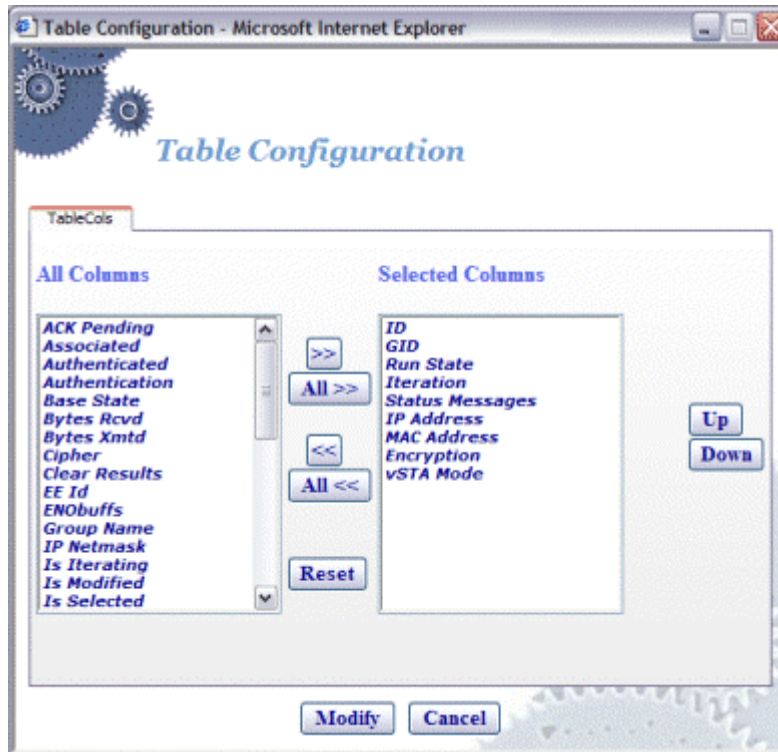
IP Address
 IP Netmask
 WLAN MAC Address
 WLAN MAC Mask

See vSTA->Add New vSTA to Group for information about the fields in this dialog.

You can right click on selected virtual stations to display the vSTA menu. Any menu option will affect the selected virtual station(s).

vSTA	
Edit vSTA...	Control+E
Initialize	Control+I
Authenticate	Control+T
Associate	Control+Shift+T
Run	Control+R
Pause	
Terminate	Control+H
Reset	Control+Shift+H

Group Tab Columns: Within a group, you can double click on the table heading to configure the columns that are displayed.



Select one or more items in the All Columns list box and click the [>>] button to move them to the Selected Columns list box. Click "Modify" to add the columns to the group table. Select "Reset" to return the columns to their default setting.

Load Profile

The Load Profile section of the page can be used to automatically execute scenarios at scheduled intervals.

Load Profile

Run tests Unscheduled ▼

After second(s)

run vSTA(s)

per All vSTA ▼

every second(s)

When automatic scheduling is defined, the grid below the Scheduling/Group table will chart the status of each virtual station over the period of the test. See "Using Load Profiles" below for more information about using this feature.

Target Systems

Below Load Profile, the main page displays a list of target systems and their signal strength in relationship to the EmulationEngine. Target

systems with a higher signal strength value have a better/higher transmission rate to the EmulationEngine.

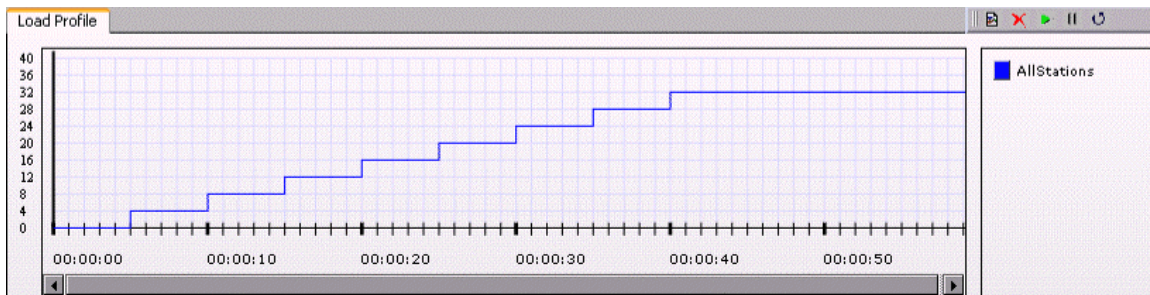
SSID	RSSI
DSM	10
APDUT	14
SMC_03	30
Omar_SMC_test	9
Noah - DLink	44
ieff	

Rescan

You can select "Rescan" to instruct the EmulationEngine to rescan for all systems. The devices shown in this list box will be displayed in the Select System Under Test dialog where you can choose a system to test.

Load Profile/Monitor Graphs

The bottom half of the web page is reserved for charts that graphically illustrate a load profile and monitor test results. When the Load Profile tab is selected, a graph shows the loading profile based on an active Load Profile.



See "Using Load Profiles" below for more information about how to set up a Load Profile.

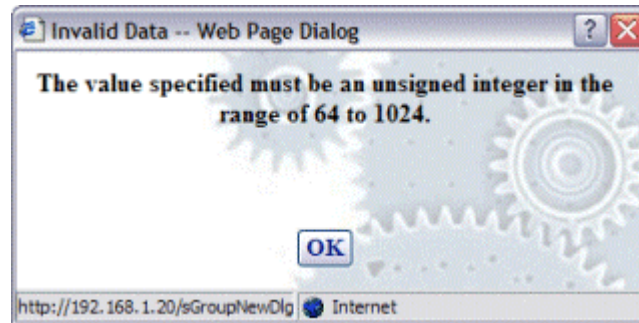
If multiple monitors have been defined, use the horizontal tabs at the top of this section of the page to select and show each monitor.

auths	deauths	assoc	disassoc	RxDataFrames	TxDataFrames	RxErrors	TxErrors
10	0	10	0	9	10	4	0

A maximum of four monitors can be defined in each scenario. The toolbar in the top-right corner of the monitor area can be used to define a new monitor, delete a monitor, run a paused monitor, pause a running monitor, and clear a monitor's display. See "Monitors Side Bar" for more information about this section of the page.

Range Checking/Error Messages

In the dialogs described later in this chapter, the user interface will verify all entries that require values within a specified range. If a field can contain a very large number, do not enter commas (,) for values larger than 999 (e.g., use 1000 rather than 1,000). If you use an invalid character in a field or specify a value that is not within range, a dialog will tell you the allowable range. Example:



When an Invalid Data dialog is displayed, click "OK" and reenter a value that is within the allowable range for the field.

Using Load Profiles

Load Profiles allow you to control the execution of virtual stations: Unscheduled or Scheduled. In Unscheduled mode, virtual stations can be manually controlled. In Scheduled mode, virtual stations can be run incrementally based on groups (all virtual stations within the group) or by individual virtual stations.

NOTE: In order to use Scheduled mode, you must disable "Batch EE Requests" in EmulationEngine configuration (See EE->Configure EE). When requests are batched for transmission to the EmulationEngine, they will not be sent at the scheduled interval defined by the Load Profile.

Run tests: Select Unscheduled or Scheduled. The default is Unscheduled. If Scheduled is selected, the Load Profile is in effect for the scenario. If Unscheduled is selected, the Load Profile is not in effect.

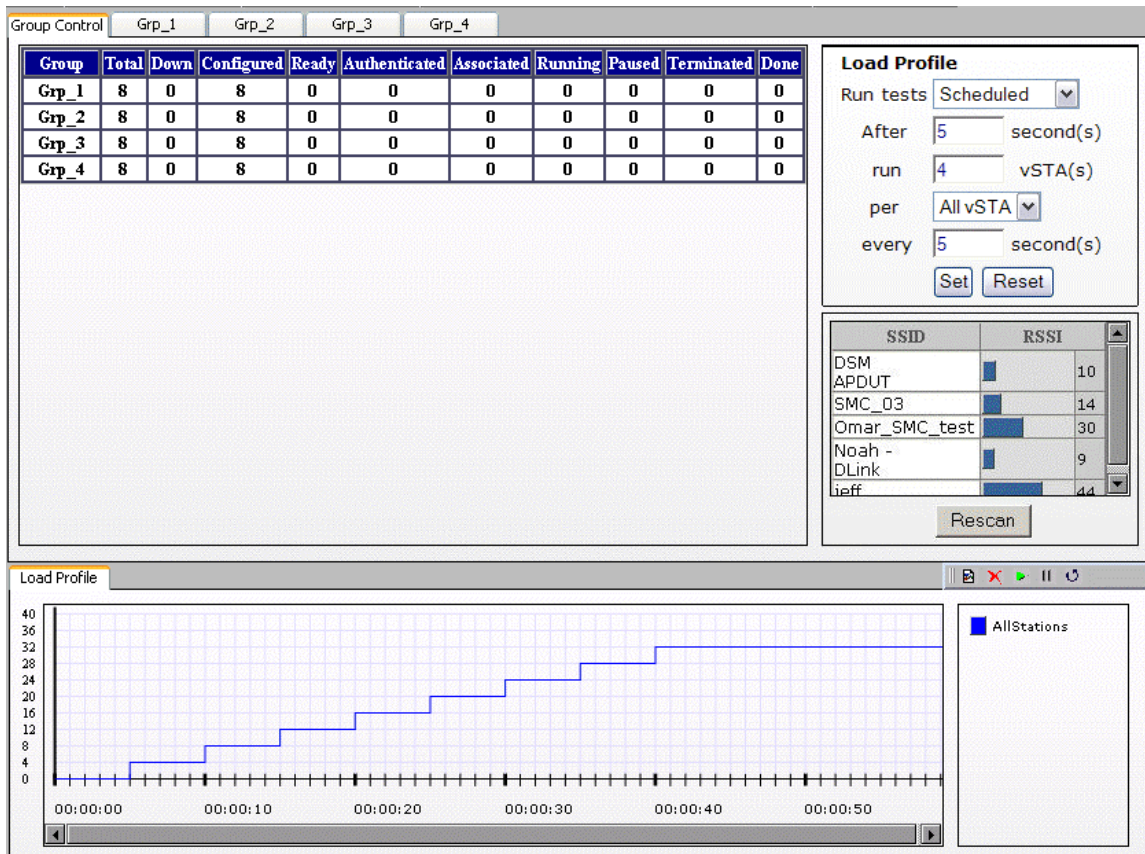
After: This field defines an initial delay before a run starts: 0...3600 seconds (1 hour). It is the number of seconds after a Run command has been issued (e.g., the Run button is selected in the toolbar) that the Load Profile will begin executing.

run: Enter the number of virtual stations to start each time interval of the load profile. The time interval is specified in the "every" field.

per: This field defines what scheduling is based on (All vSTA = all virtual stations, Groups = virtual stations within each group). If "All vSTA" is selected, the Load Profile will run the next "run" number of virtual stations at each scheduled iteration. If Group is selected, the Load Profile will run the next "run" number of virtual stations from each group at each scheduled iteration. The scheduled iteration is defined in the "every" field.

every: This field defines the number of seconds between each repetition of the Load Profile: 1...3600 seconds (1 hour). When this time expires, the next set of virtual stations (as defined in the run field) will be executed.

Select the Load Profile tab in the Load Profile/Monitors section of the page to show the Load Profile graph. The Load Profile graph displays the Load Profile setup: x-Axis = time, y-Axis = Groups or All vSTA depending on the selection in the per field. The following illustration shows an example Load Profile setup and graph:



After a delay of five seconds, the user interface will instruct the EmulationEngine to run four virtual stations. Every five seconds thereafter, the user interface will instruct the EmulationEngine to run another four virtual stations until all virtual stations have been executed. The graph depicts this scheduling scheme.

vSTA Side Bar

In the web-based user interface you can create scenarios that consist of one or more groups of virtual stations. The group configuration defines a test sequence that the EmulationEngine will activate to exercise the System Under Test. Virtual stations can be configured individually or by group. In internal mode, you can configure each virtual station and/or group to generate traffic to the system being tested. You can also configure virtual stations to operate in external mode where an external load generator will generate the traffic.



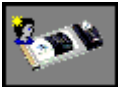
New Group: Select this button in the vSTA side bar to define a new group in a scenario.



Edit Group: Select this button in the vSTA side bar to modify the definition of a group.



Delete Group: Select this button in the vSTA side bar to remove a group and all of its virtual stations from a scenario.



Add vSTA to Group: Select this button in the vSTA side bar to define a new virtual station in a scenario group.

vSTA->New Group

The New Group dialog is used to define new groups of virtual stations in a scenario. It is a tabbed dialog with the following sections: vSTA, Traffic, Runtime, On Error, and Encryption.

vSTA->New Group->vSTA

The vSTA section of the New Emulation Group dialog defines the range of IP and MAC addresses to be used by virtual stations. The range of MAC addresses specified in this dialog must be within the range of MAC addresses defined by the WLAN Base MAC Address and WLAN MAC Mask in EmulationEngine configuration (see EE->Configure EE).

New Emulation Group

Group Name:

EE Address:

Number of Virtual Stations:

vSTA
 Traffic
 Runtime
 On Error
 Encryption

Starting IP Address:
 Netmask:
 Ending IP Address:
 Address Generation:

Starting MAC Address:
 WLAN MAC Mask:
 Ending MAC Address:
 Address Generation:

Group Name: Use a group name that helps you identify the devices that will be tested (e.g., Warehouse, Stock_Room, Control_Tour, Shop_Floor, etc.). It can be up to 12 characters (a...z, 0..9, and underscore (_)).

EE Address: This field shows the IP address of the EmulationEngine that will run this scenario/test.

Number of Virtual Stations: Enter the number of virtual stations (0...64) to be created in this scenario group. The default value is 5. If you specify zero virtual stations in this dialog, you must use the Add vSTA to Group dialog to add one or more virtual stations to this group. The Add vSTA to Group dialog will use the default parameters you set in this group definition.

Starting IP Address: If Sequential or Random is selected in the Address Generation field, enter the starting IP address to be used for virtual station IP address generation of newly created virtual stations in this group. Successive virtual station IP addresses will be sequentially or randomly generated from this base address.

Netmask: This field shows the network mask to be used by virtual stations in this group. It is not settable here. It is global for all virtual stations and is an EmulationEngine configuration parameter.

Ending IP Address: If Random is selected in the Address Generation field, enter the ending IP address to be used by virtual stations in this group when generating random addresses within a range.

Address Generation: Select Sequential, Random, or DHCP from the drop-down list box. The Sequential or Random selections will instruct the EmulationEngine to sequentially or randomly assign IP addresses to newly created virtual stations. The DHCP mode allows virtual stations to have IP addresses dynamically assigned from a DHCP server on the network rather than a fixed, configured IP address. If DHCP is selected, the EmulationEngine will initiate lease negotiation if association succeeds for each individual virtual station.

Starting MAC Address: Enter the starting MAC address to be used for virtual station MAC address generation of newly created virtual stations in this group. Successive virtual station MAC addresses will be sequentially or randomly generated from this base address. The starting MAC address must be within the range of MAC addresses defined by the WLAN Base MAC Address and WLAN MAC Mask in EmulationEngine configuration (see EE->Configure EE).

WLAN MAC Mask: The WLAN MAC Mask is a display-only field. It is defined in EmulationEngine configuration (see EE->Configure EE). It limits the range of MAC addresses that can be detected on the wireless LAN and received by the EmulationEngine. For example, if the WLAN MAC is set to 00:0b:cd:59:23:44 and the mask is set to ff:ff:ff:ff:00:00, the only MAC addresses that can be detected on the wireless LAN and received by the EmulationEngine are: 00:0b:cd:59:00:00 - 00:0b:cd:59:ff:ff. All other MAC addresses will be filtered out.

Ending MAC Address: Enter the ending MAC address to be used by virtual stations in this group.

Address Generation: Select Sequential or Random from the drop-down list box to instruct the EmulationEngine to sequentially or randomly assign IP addresses to newly created virtual stations.

- Click "Create" to create the group.
- Click "Cancel" to exit this dialog.

vSTA->New Group->Traffic

The Traffic section of the New Emulation Group dialog defines the type of traffic (Internal/Ping or External/Load Generator) to be used by the virtual station(s).